Ronald A. Jones
Vice President
New Nuclear Operations

August 24, 2015
NND-15-0518
10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Combined License Nos. NPF-93 and NPF-94
Docket Nos. 52-027 & 52-028

Subject: LAR 15-08 License Amendment Request: Supplemental Requirements for Mechanical Coupler Weld Acceptability

Reference: 1. ND-15-0904, Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, Request for License Amendment: Supplemental Requirements for Mechanical Coupler Weld Acceptability (LAR-15-010), dated August 21, 2015.

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), the licensee for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, requests an amendment to Combined License (COL) Numbers NPF-93 and NPF-94, for VCSNS Units 2 and 3, respectively. The requested amendment, identical in scope with Reference 1, requires changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document (DCD) Tier 2* and Tier 2 information.

The proposed departures consist of changes to Tier 2* and associated Tier 2 information in the UFSAR (which includes the plant-specific DCD Tier 2 information) to demonstrate that the mechanical weldable couplers to structural steel weld capacity required by ACI 349-01 is satisfied using AISC N690-1994 analysis and testing provisions.

Enclosure 1 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration Determination) and environmental considerations for the proposed changes.

Enclosure 2 provides proprietary text excerpts that are redacted from the License Amendment Request text in Enclosure 1. **The text excerpts in Enclosure 2 provide information that is considered to be proprietary; therefore, Enclosure 2 is requested to be withheld from disclosure to the public under 10 CFR 2.390.**

Enclosure 3 provides markups depicting the requested changes to the VCSNS Units 2 and 3 UFSAR.

An affidavit from SCE&G supporting withholding under 10 CFR 2.390 is provided as Enclosure 4. Enclosure 5 is Westinghouse's Proprietary Information Notice, Copyright Notice and

CAW-15-4176, Application for Withholding Proprietary Information from Public Disclosure and Affidavit. The affidavit sets forth the basis upon which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information that is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-15-4176 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066. Correspondence with respect to proprietary aspects of this letter and its enclosures should also be addressed to April R. Rice at the contact information within this letter.

SCE&G requests NRC staff approval of the license amendment by October 21, 2015, to support installation of overlay plates and embedments welded to mechanical weldable couplers in seismic Category I and seismic Category II structures. Delayed approval of this license amendment could result in a delay in the construction of the associated seismic Category I and II structures and subsequent dependent construction activities. SCE&G expects to implement this proposed amendment within 15 days of approval of the requested changes.

This letter contains no regulatory commitments.

In accordance with 10 CFR 50.91, SCE&G is notifying the State of South Carolina of this LAR by transmitting a copy of this letter and enclosures to the designated State Official.

Should you have any questions, please contact Mrs. April R. Rice, Manager, Nuclear Licensing, at (803) 941-9858.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 24TH day of August, 2015.

Sincerely,

Ronald A. Jones
Vice President
New Nuclear Operations

MHK/RAJ/mhk

Enclosures:

1) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Request for License Amendment Regarding Supplemental Requirements for Mechanical Coupler Weld Acceptability (LAR 15-08)

2) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Proprietary Text for License Amendment Request Regarding Supplemental Requirements for Mechanical Coupler Weld Acceptability (LAR 15-08)
(Withheld Information)

3) Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Proposed Changes to Licensing Basis Documents (LAR 15-08)

4) Affidavit from South Carolina Electric and Gas Company for Withholding Under 10 CFR 2.390 (LAR 15-08)

5) Westinghouse Authorization Letter CAW-15-4176, Affidavit, Proprietary Information Notice and Copyright Notice (LAR 15-08)

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South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-15-0518

Enclosure 1

Request for License Amendment Regarding

Supplemental Requirements for Mechanical Coupler Weld Acceptability

(LAR 15-08)

(Enclosure 1 consists of 27 pages, including this cover page)

Table of Contents

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), the licensee for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, requests an amendment to Combined License (COL) Numbers NPF-93 and NPF-94, for VCSNS Units 2 and 3, respectively.

1. Summary Description

Weldable mechanical couplers (couplers) are utilized in the AP1000 design where reinforcing bars (rebar) are attached to structural steel. The couplers are attached to the structural steel using a combined partial joint penetration (PJP) weld with fillet weld reinforcement. The C2/C3J type of coupler is used in containment internal structures, other seismic Category I structures, and the seismic Category II portion of the annex building located adjacent to the nuclear island.

As specified in Updated Final Safety Analysis Report (UFSAR) subsection 3.8.4.5, “Structural Criteria,” the analysis and design of concrete and structural steel conform to American Concrete Institute (ACI) 349-01, “Code Requirements for Nuclear Safety Related Concrete Structures,” (ACI 349-01) and American Institute of Steel Construction (AISC) N690-1994, “Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities,” (AISC N690-1994), respectively. The coupler weld strength is evaluated in accordance with AISC N690-1994 and ACI 349-01.

Load combinations from UFSAR Tables 3.8.4-1 and 3.8.4-2, and the corresponding Stress Limit Coefficients (SLCs), are used in the evaluation of coupler weld capacity. The coupler weld capacity for all sizes of C2/C3J couplers is found to be acceptable when compared to demand for all load combinations.

To demonstrate the adequacy of mechanical connections (rebar-coupler), ACI 349-01 requires that a full mechanical connection (rebar-coupler) develop at least 125% of the specified yield strength of the rebar. ACI 349-01 does not provide requirements on weld qualification.

The proposed change is that, using the AISC N690-1994 SLC of 1.6, rebar sizes #4, #5, and #6 C2/C3J couplers demonstrate the required weld capacity through analysis. For rebar sizes #7 through #11 C2/C3J couplers, this activity proposes testing as permitted by AISC N690-1994 Section Q1.22.2 to demonstrate the weld capacity for 125% of the specified yield strength loading of the rebar by performing a series of a minimum of six static and three cyclic tests on representative samples of each of the five sizes of the coupler-rebar-weld system, retaining the 95 percentile characteristic value with 90% probability (90%/95% confidence interval) of the tension test results per ACI 349-01 Section B.4.2; and by testing the C2/C3J coupler weld to failure using representative samples of weld configurations for each of the five C2/C3J rebar coupler sizes to establish a minimum acceptable fillet reinforcement size for the C2/C3J couplers.

Increasing weld size does not provide significant additional safety margin. Furthermore, in some locations, weld size cannot be increased due to coupler configuration and the proximity of interferences, space limitations would pose a safety hazard for workers performing the welding, or destructive measures would be necessary to access the weld.

Additional weld capacity beyond design does not provide any increase in review level earthquake/ probabilistic risk assessment (RLE/PRA) margin or aircraft impact assessment (AIA) capacity because the coupler welds exceed 125% of the specified yield strength of the rebar, assuring that the yield mechanism remains within the rebar.

The proposed change does not adversely impact any of the key structural design details documented in APP-GW-GLR-602, "AP1000 Shield Building Design Details for Selected Wall and RC/SC Connection." The C2/C3J couplers are not used internally in the shield building concrete-filled steel plate construction (SC) or reinforced concrete (RC) panels. As described in UFSAR subsection 3.8.4.1.1, the couplers are used in external connections between the shield building SC wall and the auxiliary building RC roof, the shield building SC wall and the auxiliary building RC wall, and the tension ring connection to the shield building RC roof. The proposed change does not adversely impact the design of critical sections described in UFSAR Appendix 3H.

The C2/C3J couplers were not used in construction of the panels used in the Purdue University anchorage, out-of-plane shear (with and without tension), and in-plane shear tests described in APP-1200-S3R-003, "Design Report for the AP1000 Enhanced Shield Building." The proposed change does not change the Design Report or the overall design or construction of the shield building.

The change proposed in this License Amendment Request has no impact to the requirements of the design of connections to the shield building previously approved in VCSNS Units 2 & 3 Amendment No. 21, because Amendment No. 21 did not address details of welds of the C2/C3J coupler to structural steel or faceplates of the shield building or the reinforced concrete (RC) to steel plate composite construction (SC) connections.

The requested amendment proposes changes to UFSAR Tier 2 and Tier 2* information. This enclosure requests NRC approval of the proposed changes to UFSAR Tier 2 and Tier 2* information.

2. Detailed Description

System Description

Modular construction techniques are used extensively in the nuclear island, containment internal structures, and the seismic Category II portion of the annex building located adjacent to the nuclear island. Subassemblies are initially fabricated both offsite and onsite. Module assembly consists of combining the subassemblies into structural modules after which they are installed in the plant. Structural wall modules, designed and constructed as steel plate concrete filled composite structures, and structural floor modules are used in major nuclear island and containment internal structures. As shown in Figure 1, "Weldable Coupler," rebar couplers are used to join rebar to the structural steel. Figure 1 is representative of a C2/C3J threaded weldable coupler. Rebar is threaded into weldable couplers which are fastened to structural steel using a PJP weld with fillet weld reinforcement. Structural steel includes structural steel shapes, embedded plates, overlay

plates, and structural module liner plates. The design function of the rebar and couplers is to transmit loads from the structural steel to the reinforced concrete.

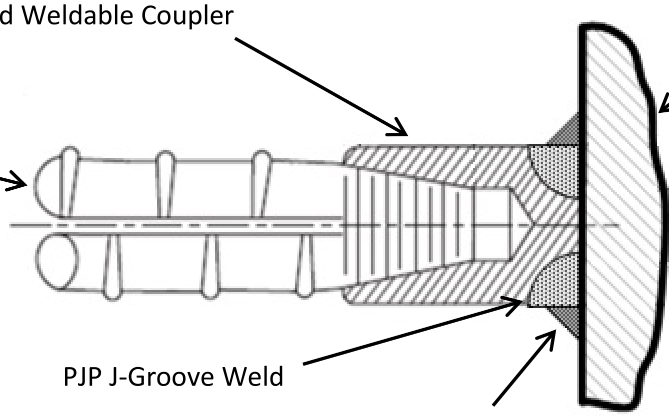

Figure 1-Weldable Coupler

The nuclear island structures (i.e., containment internal structures, containment steel shell, shield and auxiliary building) provide protection for safety-related equipment against the consequences of either a postulated internal or external event. The nuclear island structures are designed to withstand the effects of natural phenomena, such as hurricanes, floods, tornados, tsunamis, and earthquakes, or postulated internal events, such as fires and flooding, without loss of capability to perform safety functions.

The portion of the annex building adjacent to the nuclear island is a structural steel and reinforced concrete seismic Category II structure that houses the control support area, non-Class 1E electrical equipment, and the hot machine shop.

<u>Supporting Technical Details</u>

As specified in UFSAR subsection 3.8.4.5, “Structural Criteria,” the analysis and design of concrete and structural steel conform to ACI 349-01 and AISC N690-1994, respectively. AISC N690-1994 is applied to determine the capacity of rebar mechanical coupler to structural steel welds, based on the effective area of the weld. AISC N690-1994 incorporates margin into the design of steel structures by factoring in a reduction of the strength of the steel used in evaluations of steel (weld) strength. ACI 349-01 incorporates margin into the design of concrete structures by factoring in an increase in loads and a reduction in strength of the rebar and of the concrete used in evaluating the strength of the concrete.

Load combinations from UFSAR Tables 3.8.4-1 and 3.8.4-2, and the corresponding Stress Limit Coefficients (SLCs), are used in the evaluation of coupler weld capacity. The coupler weld capacity for all sizes of C2/C3J couplers is found to be acceptable when compared to demand for all load combinations.

AISC N690-1994 Section Q1.22.2.1.2 allows that design limits less conservative than those specified in this section may be used if substantiated by testing. AISC N690-1994 provides the basis for justification of testing for the ACI 349-01 evaluation of 125% of the specified yield strength of the rebar strength requirement.

A change to Tier 2 and Tier 2* UFSAR text is proposed to use testing to demonstrate the weld capacity per ACI 349-01 Section 12.14.3.4, by performing a minimum of six static and three cyclic tests on representative samples of each of the rebar sizes #7 through #11 coupler-rebar-weld system, retaining the 90%/95% confidence interval of the tension test results per ACI 349-01 Section B.4.2; and by testing the coupler weld to failure, using representative samples of C2/C3J coupler weld configurations for each of these five coupler sizes (#7 through #11).

The weld test-to-failure was performed on seventy samples, consisting of ten samples of each of the five sizes (#7 through #11) of coupler welds per the applicable design documents, with various weld positions (e.g., flat, horizontal, and overhead) to represent a range of conditions, and 20 samples using an undersized fillet weld compared to the applicable design documents. The testing results demonstrate the ultimate capacity of the coupler weld and provide justification that the coupler weld capacity is acceptable and provides sufficient margin to failure. Performance of demonstration tests of representative samples of the coupler-rebar-weld system, and tests of the coupler welds to failure, does not constitute any requirement for production testing of these welds.

Description of any Changes to Current Licensing Basis Documents

A change is proposed to revise Tier 2* text in UFSAR subsection 3.8.4.5.1 to specify reinforcing bar size #4, #5, and #6 C2/C3J weldable coupler attachment welds are qualified in accordance with AISC N690-1994 and ACI 349-01 by demonstrating through analysis a minimum capacity of 125% of the specified yield strength of the reinforcing bar using a stress limit coefficient of 1.6. The change also specifies the coupler to structural steel weld strength for reinforcing bar size #7, #8, #9, #10, and #11 couplers per ACI 349-01 Section 12.14.3.4 is demonstrated through testing, as permitted by AISC N690-1994 Section Q1.22.2, by performing a minimum of six static and three cyclic qualification tests on samples of each of the five sizes of the rebar-coupler-weld system, retaining 90%/95% confidence interval of the tension test results per ACI 349-01 Section B.4.2.; and by testing the coupler weld to failure using ten representative sample weld configurations from each of the five reinforcing bar coupler sizes to establish a minimum fillet reinforcement size for the C2/C3J couplers.

3. Technical Evaluation

As specified in UFSAR subsection 3.8.4.5, “Structural Criteria,” the analysis and design of concrete and structural steel conform to ACI 349-01 and AISC N690-1994, respectively. Supplemental requirements for concrete structures are listed in UFSAR subsection 3.8.4.5.1.

The weldable coupler anchors reinforcing steel to structural steel. Because the anchorage involves concrete, reinforcement, and structural steel including welds, both ACI 349-01 and AISC N690-1994 provide design requirements. The coupler weld joins the steel coupler to the structural steel and is governed by AISC N690-1994 and American Welding Society (AWS) "Structural Welding Code – Steel," (AWS D1.1). [Note that AWS D1.1-1992 is applicable in accordance with the current licensing basis; however, should the NRC approve SCE&G LAR 15-09, the criteria of AWS D1.1-2000 will be incorporated for use in lieu of the AWS D1.1-1992 version identified in AISC N690-1994.] The mechanical connection of the reinforcing bar to the coupler is governed by ACI 349-01.

The proposed change specifies that the ACI 349-01 coupler weld strength demonstration requirement is met by analysis or testing samples of coupler PJP welds with fillet weld reinforcement capacity to 125% of the specified yield strength of the reinforcing bar (rebar). Rebar size #4, #5, and #6 C2/C3J couplers are evaluated analytically. Rebar size #7, #8, #9, #10, and #11 C2/C3J couplers are evaluated by a series of a minimum of six static and three cyclic qualification tests on representative samples of each of the five sizes of the coupler-rebar-weld system, retaining the 90%/95% confidence interval of the tension test result, and by testing to failure ten representative sample weld configurations for each of these five C2/C3J coupler sizes, to establish minimum acceptable fillet reinforcement sizes for the C2/C3J couplers.

AISC N690-1994 Load Combination Evaluation

AISC N690-1994 is the governing code for weld design. The coupler weld capacity is compared to demand in accordance with the UFSAR Table 3.8.4-1 and 3.8.4-2 load combinations. The AISC N690-1994 code requirements are met by demonstrating that the coupler welds are adequate for all design basis load combinations using the corresponding Stress Limit Coefficient (SLC) to determine the allowable weld stress.

The demand on the weld is calculated from the AISC N690-1994 load combinations and is compared to the capacity of the weld using the associated SLC. Stress ratios calculated from weld demand divided by the C2/C3J coupler weld capacity have been evaluated and are less than or equal to 1.0. Therefore, the coupler welds are acceptable for all load combinations in accordance with UFSAR Tables 3.8.4-1 and 3.8.4-2 and are in accordance with AISC N690-1994 weld strength requirements. The load combination evaluation has determined that the C2/C3J coupler weld capacity is acceptable when compared to demand calculated in accordance with UFSAR and AISC N690-1994 requirements.

ACI 349-01 125% Yield Strength Evaluation

The requirements for mechanical anchorage of reinforcing steel are provided in ACI 349-01. As applicable to the coupler-rebar splice system, a splice made by full mechanical connection must develop 125% of the specified yield strength of the reinforcing steel as required by ACI 349-01 Section 12.14.3.4. ACI 349-01 Section 12.14.3.4 requires that:

> "*A full mechanical connection shall develop in tension or compression, as required, at least 125% of specified yield strength f_y of the bar.*"

The Commentary to ACI 349-01 Section 12.14.3 (by reference to ACI 318-95) states that:

> "*The maximum reinforcement stress used in design under the Code is the specified yield strength. To ensure sufficient strength in splices so that yielding can be achieved in a member and thus brittle failure avoided, the 25 percent increase above the specified yield strength was selected as both an adequate minimum for safety and a practicable maximum for economy.*"

The coupler strength requirement is extended to the weld to demonstrate that the coupler weld is stronger than the rebar. For rebar size #4, #5, and #6 C2/C3J couplers, analytical evaluation of the weld using an SLC of 1.6 shows that the weld strength exceeds 125% of the specified yield strength of the rebar. The SLC of 1.6 is chosen because it represents the lowest design limit for seismic load combinations.

The ACI 349-01 requirement for the mechanical connection to meet 125% of the specified strength of the reinforcing bar has been applied to the coupler weld to demonstrate that the coupler weld is stronger than the reinforcing bar. The scope of AISC N690-1994 Section Q1.22 includes requirements for design of anchorage of items embedded in concrete that are in tension. AISC N690-1994 Section Q1.22.2.2 states that:

> *"Design of welded joints shall be in accordance with the requirements of the applicable provisions of this specification."*

The weld strength required to meet the 125% of the specified yield strength of the reinforcing bar exceeds the AISC N690-1994 weld stress limits for design loads. Because the requirement to provide 125% of the specified yield strength of the reinforcing bar is not directly included in AISC N690-1994 Table Q1.5.7.1, the additional AISC N690-1994 Section Q1.22 provisions for design limits are followed.

AISC N690-1994 Section Q1.22.2.1 states that:

> "*Design* limits less conservative than those specified in this section may be used by the Engineer if substantiated by experimental or detailed analytical investigation."

Testing of welds is performed to demonstrate that the weld strength exceeds 125% of the specified yield strength of the reinforcing bar. It is also acceptable to demonstrate adequate weld strength by evaluation to AISC N690-1994 Table Q1.5.7.1 stress limits for 125% of the specified yield strength of the reinforcing bar. If the AISC N690-1994 Table Q1.5.7.1 stress limit analytical approach is used, an SLC of 1.6 is applied. For rebar sizes #4, #5, and #6 C2/C3J couplers, analytical evaluation of the weld using an SLC of 1.6 shows that the weld strength exceeds 125% of the specified yield strength of the rebar. Larger bar size couplers (sizes #7, #8, #9, #10, and #11) are evaluated by testing.

A comparison of the expected yield strength and tensile strength of the rebar to the specified minimum strength of the coupler weld was performed for each of the coupler weld sizes to confirm that the failure mode is always in the rebar or the mechanical (threaded) connection of the rebar. The comparison considers the specified minimum strength of the weld metal and the coupler metal; and the expected tensile strength of the reinforcing bar, which is obtained from American Institute of Steel Construction (AISC), "Seismic Provisions for Structural Steel Buildings," (AISC 341-2010) Table A3.1. In the comparison, the #9 coupler weld is the highest stress weld.

a,c

(See Enclosure 2, Proprietary INSERT 1)

The comparison of the specified minimum strength of the weld to the expected strength of the reinforcing bar demonstrates that the reinforcing bar will fail prior to the weld. The expected upper-bound strength is based on surveys of production data as described in the commentary to AISC 341-10 Section A3.2. The comparison demonstrates that the limiting failure strength is the rebar or mechanical (threaded) connection of the rebar, and that the coupler welds develop 125% of the specified yield strength of the rebar coupler weld within the specified yield strength of the weld material. This approach is consistent with current versions of the AISC specification for structural steel (e.g., AISC 360-10) in which the full ductile load-deformation response is used to calculate capacity to satisfy minimum strength requirements for structural integrity. In addition, the welds develop the specified minimum tensile strength of the rebar within the specified yield strength of the weld material. The comparison also demonstrates that for beyond-design basis events (e.g., beyond design basis seismic event or aircraft impact event) a ductile failure mode is assured because yielding of the rebar is the limiting feature of the welded coupler splice. Increasing weld size does not provide significant additional safety margin as the yield mechanism remains within the rebar.

Testing has been performed for rebar size #7 through #11 C2/C3J couplers. The first set of tests (Phase I) consisted of six static and three cyclic specimens of each coupler size including the rebar, coupler, and coupler weld. The weld size was made equal to, or less than, the size specified on the design drawings to prevent oversized welds. For Phase 1 static tests, a coupler was welded to a base plate, and the rebar was threaded into the coupler per manufacturer recommendations. The rebar-base plate assembly was mounted in the tensile test machine. For the Phase I cyclic tests, a coupler was welded to both sides of a base plate, and the reinforcing bars were threaded into the couplers per manufacturer recommendations. The reinforcing bars were clamped in the tensile test machine.

The static tests were performed until either the rebar or the mechanical connection of the rebar to the coupler failed. The cyclic tests were performed by applying 100 cycles of tensile stress variation from 5% to 90% of the specified yield strength of the rebar and then tested statically to failure. The cyclic tests were performed to confirm that the static break strength was not influenced by load cycling. The static test results were evaluated to obtain

the 90%/95% confidence interval break strength for each coupler size. The 90%/95% confidence interval break strength exceeds both 125% of the specified yield strength (75 ksi) of the rebar and 100% of the specified tensile strength (90 ksi) of the rebar. The tests demonstrate that the weld strength exceeds 125% of the specified yield strength and also exceeds the specified tensile strength of the rebar.

Additional tests (Phase II) were performed by pulling the #7 through #11 C2/C3J coupler welds, in tension, to failure. The test plan for pulling the welds to failure and the coupler weld position for the tests are documented in licensee reviewed test plans. The tests are performed statically. Seismic loads are not considered high-cycle events, and are evaluated to static stress limits. The purpose of the test is to derive the margin between the proposed static stress limit and the static ultimate strength of the weld. The cyclic testing in ACI 349-01 Section 12.14.3.4.1(b) addresses the mechanical connection, and is a low-cycle elastic load used to demonstrate that the mechanical connection is robust and not subject to disruption under elastic design loads prior to being tested to its static limit.

The Phase II tests were performed by manufacturing an extended length coupler of the same material used for the production couplers which could be clamped directly in the tensile test machine. The extended length couplers were welded to a base with a weld size made equal to, or less than, the size specified on the design drawings. The extended length coupler assembly is illustrated in Figure 2. The base structure is supported with an oversized reinforcing bar and coupler, with oversized welds so that the failure mode is expected on the test side of the specimen (i.e., at the coupler weld to the base structure.)

a,c

(See Enclosure 2, Proprietary INSERT 2)

Figure 2 – Coupler Weld Test to Failure Assembly for Phase II Testing

Specimens of each size coupler were welded in flat, horizontal, and overhead positions to address any potential variability in strength due to weld position. Five flat, three horizontal, and two overhead weld positions were performed for a total of ten specimens for each coupler size. Weld variability was considered in the testing to be certain that the welding and environmental conditions were representative of the design. The following items were considered in application of the welds to the test specimens for Phase II tests:

- Sample size

  Ten test specimens each of the #7, #8, #9, #10, and #11 coupler sizes were tested using the design weld size. Ten additional test specimens each of the #9 and #11 coupler sizes were tested using a smaller fillet weld size in order to confirm consistency in the results with respect to the size of the reinforcing fillet weld, as well as to address non-conforming weld sizes. The total sample size was 70 specimens, of which 50 were made with the design fillet weld size, and 20 were made with an undersized fillet weld. The sample size was initially chosen based on advice from an expert in the structural testing field as well as the performance of two proof-of-concept tests that demonstrated that a relatively small sample size would provide the desired confidence. A further practical need was introduced by the desire to perform welds in the flat, horizontal, and overhead positions. The vendors performing the production welds were consulted to obtain rough percentages of each of the weld positions used during production. The vendor reported that approximately 85% to 90% of the welds are made in the flat position; 10% to 15% are made in the horizontal position; and that 5% or fewer of the welds are made in the overhead position. Based on these estimates and the desire to have at least two samples for any particular position, ten samples of each coupler size were chosen.

- Weld position

  Five flat, three horizontal, and two overhead weld positions are used for each set of coupler specimens. The numbers are representative of the percentage of application of each position in the production welds, as discussed above.

- Weld process

  A qualified weld process is used for both the testing and the production welds. The weld qualification is performed to AWS D1.1-2000 requirements. Gas Tungsten Arc Welding (GTAW) was selected for the test samples to closely control weld size. The welders can control the weld puddle better using GTAW in the small diameter coupler weld. In addition, post-weld cleanup is minimized when compared to other processes. The GTAW process is used for many of the production welds. However, other processes are also used for production welds. Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), and Flux-core Arc Welding (FCAW) processes are all used for coupler production welds.

  It is noted that each of the weld processes has technical and practical advantages and disadvantages which may cause the fabricator to choose one method over another. For example, the GTAW process is often used to create high-quality root-pass welds, and is considered a high-quality process. GTAW is also considered a welding process

that requires high operator skill, and is typically operated at higher heat input than other processes which can cause excess distortion if not properly accounted for. The welds produced by each of the processes is AWS code approved and the welding procedure specification (WPS), which provides required welding variables for a specific application, requires qualification by test as described in licensee reviewed reinforcing steel supply and installation specifications. The welds produced by each of the processes is treated as equivalent in strength by both AISC N690-1994 and AWS D1.1-2000 once qualified; a limited review of the literature provided no quantitative difference in weld strength due to weld process.

Adherence to AWS D1.1-2000 specified criteria for electrode type, heat input, deposit rate, and other parameters is necessary to achieve high quality welds. Vendors fabricating coupler welds for construction modules use approved quality plans in execution of AWS specifications for welding. Inspection of the processes and welds is performed to confirm adherence to weld requirements. There is an expectation that in adherence to the code-approved requirements, each of the welding processes will achieve the codified strength. However, the Phase II coupler testing does not use each process in the sample welding to eliminate any potential bias in strength toward a particular process. While this is a limitation of the Phase II testing, it is not considered to be a particularly significant bias for the following reasons. Welds are designed based on the mechanical properties of the weld metals. In the case of the coupler welds, two procedure qualifications are used as described in licensee reviewed reinforcing steel supply and installation specifications, to ensure the erector/fabricator can provide a sound weld for the chosen welding process: the AWS D1.1-2000 plate test (tensile and bends); and, an actual configuration test (pull test and macro specimen).

Because the purpose of the Phase II testing is to determine the static tensile strength of the weld, the filler metal strength (F_{EXX}) and effective throat (A_w) are the critical parameters. The weld filler metal strength can be achieved independent of the weld process. The geometry of the coupler weld is such that the stresses at the fusion area with the base metal are not critical. Failure occurs through the weld metal. Per licensee reviewed reinforcing steel supply and installation specifications, macro specimens are required as part of the procedure qualification. The macro specimen is required to show full fusion to the root of groove per Section 6.2.6.2 of American Welding Society (AWS) "Structural Welding Code – Reinforcing Steel," AWS D1.4-1998. Each of the processes demonstrates full root fusion, resulting in equivalence in theoretical effective throat area for a given weld size. The parameters associated with the weld process used to fabricate the weld are less significant than the weld filler metal strength and effective throat length, because the Phase II testing is a comparison of the predicted weld strength ($F_{EXX}A_w$), to the actual test strength. Therefore, while it is noted that there may be bias toward weld process, it is not considered significant enough to study welds made with various processes.

- Filler metal

The filler metal is procured under the same process and to the same requirements as used for design. Certified Material Test Reports (CMTRs) for the material include

yield, tensile, % elongation, and Charpy V-Notch Toughness impact results. The filler metal meets the requirements of AWS A5.18 for the GTAW process, and the mechanical properties are consistent with the AISC 341-2010 requirements for demand critical welds. The weld metal mechanical properties are summarized in Table 1.

Weld Filler Metal Mechanical Properties		
Property	**ER70S-2 GTAW Filler Metal**	
	Specified Minimum	**CMTR**
Yield Strength, ksi	58	87
Tensile Strength, ksi	70	98
Elongation, %	22	27
Charpy V-Notch Toughness, ft-lb	20 @ 0 °F	>20

Table 1 – Weld Summary

- Preheat and interpass temperature

  The welding procedures reflect the AWS D1.1-2000 requirements for both preheat and interpass temperature. The same welding procedure that is used for production welding is used for the testing.

- Weld rate and current

  The welding procedures reflect the AWS D1.1-2000 requirements for both weld rate and current. The same welding procedure that is used for production welding is used for the testing.

- Automatic vs. manual welding

  Manual welding is performed for the tested welds. Production welds are performed using manual or mechanized processes, as defined in AWS D1.1-2000. Automatic welding is not used for the production welds. The welding process is qualified as part of the weld qualification to AWS D1.1-2000.

- Service temperature

  The welded couplers are used in various locations within the nuclear island and are embedded in concrete. Charpy impact testing requirements of 20 ft-lb at 0°F are imposed on the filler metal to assure ductile performance under low temperature service conditions. The mechanical properties, including Charpy impact testing requirements, are consistent with current code seismic provisions for demand critical welds (e.g., AISC 341-2010). The effect of service temperature on the weld capacity

can be quantified by considering the variability in yield and tensile strength values at temperature. Lower ambient temperatures do not significantly affect the static strength of the weld or base metal. For the coupler connection, the rebar is the ductile element. Ductility of the system is controlled by the rebar; this is ensured by over-strength provided by the welded connection. Under higher temperature conditions (e.g., accident), the yield and tensile strength reduction is not significant because of the same effect on the connected material (reinforcing bar, structural steel). Conservatively considering a 5% reduction per 100°F increase in temperature from a base of 100°F, the 10% reduction in the yield strength of the weld material to 52 ksi is still greater than the 43.6 ksi stress on the weld at 125% of the specified yield strength of the rebar. While temperature does have an effect on the service performance of the welds, it does not have a significant effect on the Phase II testing as being representative of the production welds. The sample welds were produced in a shop environment similar to the production shop conditions (e.g., 50°F to 120°F) that do not have significant effect on the weld performance. The welding procedure was qualified with AWS D1.1-2000 code requirements for both preheat and interpass temperature. While field welding of the production couplers may be performed, conformance to AWS requirements maintains application within the temperature range represented.

- Human performance factors

  Welders are required to meet qualification requirements for production welds, and the same qualification requirements were applied to the Phase II test samples. Random assignment of welders to each of the samples eliminated bias toward a particular welder. Pre-job briefs prior to test sample welding were performed as part of a nuclear-safety environment; the pre-job briefs were representative of pre-job briefs held for production welds. It is noted that the importance of the welding was stressed during the pre-job briefs in recognition that the test welds were equivalent in importance to production welds; however, there were no quantified differences in the welding in comparison to production welds (e.g., same welder and process qualification as production welds). While a schedule was used to meet project objectives, the adherence to quality requirements including qualification and process requirements eliminated bias due to schedule constraint.

- Non-Destructive Examination (NDE)

  Completed coupler production welds require 100% Visual Inspection (VT). Liquid Penetrant Inspection (PT) or Magnetic Particle Inspection (MT) is required for 10% of the cumulative coupler weld length, or the entire coupler weld on a 1-in-10 basis. The Phase II test weld NDE was limited to visual inspection for quality and weld size. The NDE was limited to VT for the test welds for conservatism. PT and MT were not performed for the test welds, which potentially broadens the distribution of results to the low strength side. While these inspection steps used for production welds were not used for the test samples, the results remain representative of the test welds with potential bias to the low strength side of the distribution.

It is concluded that the Phase II tested welds are representative of the quality and performance of the production welds considering the inherent variations established by the AWS code. The same American Welding Society (AWS) “Structural Welding Code – Steel,”

(AWS D1.1-2000) requirements used in the production welds are maintained for the test welds.

The break-strength results of the tests were compared to the capacity of the weld using the measured (CMTR) weld tensile strength ($F_{EXX}A_w$, where F_{EXX} = weld metal tensile strength and A_w = effective area of the weld). The tests demonstrate that the mean weld break strength exceeds the calculated tensile strength of the weld material. The 90%/95% confidence interval for the tests was calculated in order to address the sample size for use in computing the margin between expected yielding of the reinforcing bar and failure of the weld.

Of the 70 samples tested, 49 broke at the tested weld. Ten of the samples broke in the coupler body, and eleven failed at the base-side reinforcing bar. The #7 coupler body has lower tensile strength (80 ksi) than the #8 through #11 coupler bodies (90 ksi) and tends to influence the failure mode in the #7 test toward coupler body failure rather than weld failure. However, this bias was accepted in the results because the same materials are used in the production couplers. The #8 test sample base-side reinforcing bar was close in strength to the #8 weld strength, and tended to fail prior to weld failure. While the eleven specimens that failed in the base structure resulted in under-estimation of the weld strength, this bias was accepted because it is a conservative result. Both sample sizes follow a normal distribution.

a,c

(See Enclosure 2, Proprietary INSERT 3)

Table 2 - Factor of Safety Calculated from Phase II Test 90%/95% Confidence Interval Result

FS_1 is the ratio of the Phase II test 90%/95% confidence interval result to 125% of the specified yield strength of the reinforcing bar. It demonstrates the factor of safety with respect to the expected yielding of the reinforcing bar. FS_2 is the ratio of the Phase II test 90%/95% confidence interval result to the upper confidence level from the Phase I testing. It demonstrates the factor of safety with respect to the expected ultimate strength of the reinforcing bar or mechanical connection of the reinforcing bar to the coupler. FS_2 provides additional confirmation that the limiting failure mechanism for the coupler is the reinforcing bar or mechanical connection, and not the coupler weld. The tests demonstrate that there is a factor-of-safety of at least 1.50 between the weld stress at 125% of the specified yield strength of the rebar and the 90%/95% confidence interval result from the tests using the specified minimum tensile strength of the weld. Because the stresses in the weld remain below the specified yield strength of the weld material, full ductile response of the weld is maintained at 125% of the specified yield strength of the reinforcing bar. The testing assures that: (1) there is adequate margin between the weld stress at 125% of the specified yield strength of the reinforcing bar and the specified tensile strength of the weld; and, (2) there is additional margin beyond the specified tensile strength of the weld prior to weld failure. The minimum factor-of-safety of 1.50 between the calculated weld stress at 125% of the specified yield strength of the rebar and the 90%/95% confidence interval result from the tests using the specified minimum tensile strength of the weld provides adequate margin to failure, and has been proven to be consistent based on the results of the tests. The tests results are illustrated in Figure 3.

a,c

(See Enclosure 2, Proprietary INSERT 4)

Figure 3 – Factor of Safety Calculated from 90%/95% Lower Confidence Limit Using Specified Minimum Weld Tensile Strength Values

The tests demonstrate that the factor of safety between the weld 90%/95% lower confidence limit and 125% of the specified yield strength of the reinforcing bar is at least 1.50 (i.e., exceeds 1.4). The tests also demonstrate that the factor of safety between the weld

90%/95% lower confidence limit and the 90%/95% upper confidence limit of the coupler system static tension test results exceeds 1.0. The tests and analyses establish a minimum fillet reinforcement size for the C2/C3J couplers as shown in Table 3:

C2/C3J Coupler Size	#4	#5	#6	#7	#8	#9	#10	#11
Minimum Acceptable Fillet Weld Size (inches)	1/4	1/4	1/4	1/4	1/4	5/16	1/4	3/8

Table 3 – Minimum Acceptable Fillet Weld Size

The proposed change specifies how testing is used to determine the combined capacity of the PJP weld with fillet weld reinforcement used to join the rebar coupler to structural steel. Performing demonstration tests of representative samples of the coupler-rebar-weld system and testing welds to failure, does not constitute any requirement for production testing of these welds.

The change has no adverse effect on the design function of the mechanical couplers or the SSCs where the mechanical couplers are used.

<u>Coupler Weld Evaluation for Disposition of Non-Conforming Fillet Weld Size</u>

The #9 and #11 undersized (per the applicable design documents) fillet welds were tested as part of the Phase II sample set. Comparison of the 90%/95% lower confidence interval result to 125% of the specified yield strength of the reinforcing bar and to the Phase I 90%/95% upper confidence interval result are summarized in Table 4 and Figure 4. The results confirm that the 1/4-inch fillet welds are sufficient to demonstrate that the reinforcing bar remains the limiting feature of the coupler weld system. These test results are only used for re-disposition of non-conforming welds described in the licensee's nonconformance and disposition reports for the #9 and #11 coupler size welds identified in module CA20 and are not used for future weld sizing.

a,c

(See Enclosure 2, Proprietary INSERT 5)

Table 4 – Factor of Safety Calculated from Phase II Test 90%/95% Confidence Interval Result for Non-Conforming Fillet Weld Size

a,c

(See Enclosure 2, Proprietary INSERT 6)

Figure 4 – Factor of Safety Calculated from 90%/95% Lower Confidence Limit Using Specified Minimum Weld Tensile Strength Values for Non-Conforming Fillet Weld Size

Conclusion

Based on the evaluation of the coupler welds, the following conclusions are drawn for the following fillet weld sizes:

C2/C3J Coupler Size	#4	#5	#6	#7	#8	#9	#10	#11
Minimum Acceptable Fillet Weld Size (inches)	1/4	1/4	1/4	1/4	1/4	5/16	1/4	3/8

- The load combination evaluation determined that the C2/C3J coupler weld capacity is acceptable when compared to demand calculated in accordance with UFSAR and AISC N690-1994 requirements.
- Full ductile response of the weld is maintained at 125% of the specified yield strength of the reinforcing bar.
- The tests confirm that there is a minimum factor-of-safety of 1.50 between the calculated weld stress at 125% of the specified yield strength of the rebar and the 90%/95% confidence interval result from the tests using specified minimum tensile strength of the weld.
- The tests confirm that the coupler welds are adequate for 125% of the specified yield strength of the rebar and assure ductile performance of the welded coupler connection.

- The use of testing to demonstrate the strength of the coupler welds does not adversely affect the seismic response of the nuclear island, including containment internal structures, the auxiliary and shield buildings, and basemat because the coupler welds exceed 125% of the rebar specified yield strength, assuring ductile behavior of the rebar anchorage, and assuring that the failure mechanism remains ductile yielding of the rebar as specified by ACI 349-01 Chapter 21.
- The use of testing to demonstrate the strength of the coupler welds does not adversely affect the review level earthquake/probabilistic risk assessment (RLE/PRA) evaluation of the nuclear island because the coupler welds exceed 125% of the specified yield strength of the rebar, assuring that the yield mechanism remains within the rebar; additional weld capacity does not provide any increase in RLE/PRA margin.
- The use of testing to demonstrate the strength of the coupler welds does not adversely affect the aircraft impact assessment (AIA) because the failure mechanism remains ductile yielding of the rebar as specified by ACI 349-01 Chapter 21; additional weld capacity does not lead to any increase in AIA capacity.
- The use of testing to demonstrate the strength of the coupler welds does not adversely affect local stress evaluation because the weld is adequately sized for design basis demand in accordance with both AISC N690-1994 load combination SLCs and ACI 349-01 load combination factor loads as well as for 125% of the specified yield strength of the anchored rebar.
- The strength of the coupler welds does not adversely affect rebar ductility because analysis and/or testing demonstrate that the weld capacity exceeds the rebar/mechanical connection capacity.
- The use of testing to demonstrate the strength of the coupler welds does not adversely affect safety margin and provides adequate protection. The coupler weld strength exceeds the rebar/mechanical connection capacity, provides adequate protection, and an increase in weld size will not provide significant additional safety margin.

In addition, the tests confirm that the non-conforming fillet welds for #9 and #11 couplers identified in module CA20 are acceptable because full ductile response of the weld is maintained at 125% of the specified yield strength of the reinforcing bar, and the results will be used to re-disposition the welds described in licensee's nonconformance and disposition reports for the #9 and #11 coupler size welds discovered during construction. Increasing weld size does not provide significant additional safety margin. Furthermore, in some locations, weld size cannot be increased due to coupler configuration and the proximity of interferences, space limitations would pose a safety hazard for workers performing the welding, or destructive measures would be necessary to access the weld.

<u>Change Evaluation</u>

Testing representative welds to demonstrate 125% of the specified yield strength of the rebar joined to structural steel is analogous to conditions the weld-coupler-rebar will experience when the design function of the SSC is required. The proposed change, to clarify how the weld evaluation for welds of couplers is performed and to establish a minimum fillet reinforcement size for the C2/C3J couplers, does not change the support, design, or operation of mechanical and fluid systems. The change to the evaluation of the

welds of the couplers does not change the capacity, function, or response to anticipated transients or postulated accident conditions of any system, structure, or component (SSC). There is no change to plant systems or the response of systems to postulated accident conditions. The proposed change does not affect the prevention or mitigation of abnormal events; e.g., accidents, anticipated operational occurrences, earthquakes, floods and turbine missiles, or their safety or design analyses. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor does the change described create any new accident precursors.

The proposed change does not adversely affect any safety-related equipment, design code, design code allowable value, function or design analysis, nor does the proposed change adversely affect any safety analysis input or result, or design/safety margin. The proposed change does not interface with or affect safety-related equipment or a fission product barrier. No system or design function or equipment qualification would be adversely affected by the proposed change. The change does not result in a new failure mode, malfunction or sequence of events that could adversely affect a radioactive material barrier or safety-related equipment. The proposed change does not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures.

The proposed change specifies the design requirements for weldable couplers used in containment internal structures, the auxiliary and shield buildings, and the seismic Category II portion of the annex building. The proposed change does not adversely impact any of the key structural design details documented in APP-GW-GLR-602, "AP1000 Shield Building Design Details for Selected Wall and RC/SC Connection." The C2/C3J couplers are not used internally in the shield building concrete-filled steel plate construction (SC) or reinforced concrete (RC) panels. As described in UFSAR section 3.8.4.1.1, the couplers are used in external connections between the shield building SC wall and the auxiliary building RC roof, the shield building SC wall and the auxiliary building RC wall, and the tension ring connection to the shield building RC roof.

The C2/C3J couplers were not used in construction of the panels used in the Purdue University anchorage, out-of-plane shear (with and without tension), and in-plane shear tests described in APP-1200-S3R-003, "Design Report for the AP1000 Enhanced Shield Building." The activity described does not change the Design Report or the overall design or construction of the shield building.

The proposed change does not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses, thus, the consequences of accidents are not affected. This change does not affect the containment, control, channeling, monitoring, processing or releasing of radioactive or non-radioactive materials. The location and design of penetrations and the permeability and waterproofing of the concrete in the exterior walls are not changed. The interface between the nuclear island and the external surrounding environment is not impacted by the proposed change. The types and quantities of expected effluents are not changed. No effluent release path is affected. The functionality of the design and operational features that are credited with controlling the release of effluents during plant operation is

not diminished. Therefore, neither radioactive nor non-radioactive material effluents are affected. Plant radiation zones, controls required by 10 CFR Part 20, and expected amounts and types of radioactive materials, are not affected by the proposed change. Therefore, individual and cumulative radiation exposures do not change.

The proposed change does not involve, nor interface with, any structure, system or component accident initiator or initiating sequence of events, and thus, the probabilities of the accidents evaluated in the UFSAR are not affected.

The proposed change has no adverse effect on the ex-vessel severe accident. The overall design, geometry, and strength of the containment internal structures and other seismic Category I structures are not adversely affected. The design and material selection of the concrete floor beneath the reactor vessel is not altered. The response of the containment to a postulated reactor vessel failure, including direct containment heating, ex-vessel steam explosions, and core concrete interactions is not altered by the change to the design requirement for the weldable mechanical couplers used in structural modules. The design of the reactor vessel and the response of the reactor vessel to a postulated severe accident are not altered by the proposed change.

The proposed change has no impact on the Aircraft Impact Assessment (AIA). The change described is internal to the structures and does not impact the design or response of the containment vessel and shield building because the failure mechanism remains ductile yielding of the rebar, as analyzed in the AIA, and not of the weld. There is no change to protection of plant structures, systems, and components against aircraft impact provided by the design of the shield building. There is no change to the conclusion that a strike upon the auxiliary building would not result in loss of spent fuel pool liner integrity. There is no change to the design of key design features described in UFSAR Appendix 19F.

The proposed change does not adversely impact the design of critical sections described in UFSAR Appendix 3H.

The change activity has no impact on the emergency plans or the physical security evaluation because there are no changes to the configuration of walls, doors, or access to the Nuclear Island.

<u>Summary</u>

The proposed change would revise UFSAR subsection 3.8.4.5.1 Tier 2* information to specify the requirements of American Concrete Institute (ACI) 349-01 “Code Requirements for Nuclear Safety Related Structures,” (ACI 349-01) for demonstrating that weld capacity for C2/C3J weldable couplers to structural steel satisfies the 125% of the specified yield strength of the reinforcing bar (rebar) requirements, by analysis of rebar sizes #4, #5, and #6 using a 1.6 stress limit coefficient (SLC). The proposed change to UFSAR subsection 3.8.4.5.1 also incorporates requirements as permitted by American Institute of Steel Construction (AISC) N690-1994, “Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities,” (AISC N690-1994) Section Q1.22.2, for testing samples of the C2/C3J size #7, #8, #9, #10, and #11 rebar-coupler-PJP weld with fillet weld reinforcement combination using a series of a minimum of six static and three cyclic tests, retaining the 90%/95% confidence interval of the tension test results per ACI 349-01 Section B.4.2; and testing to failure representative samples of weld configurations of each of the five coupler sizes used to join couplers to structural steel to establish a minimum

fillet reinforcement size for the C2/C3J couplers. The proposed change adds Tier 2 information to UFSAR subsection 3.8.4.5.1 specifying the tests also demonstrate non-conforming 1/4-inch fillet welds for #9 and #11 C3J couplers are acceptable.

The proposed change does not adversely affect the design functions of the rebar couplers or the structures in which the couplers are used.

The proposed change does not adversely impact any of the key structural design details documented in APP-GW-GLR-602. The proposed change provides adequate protection for design basis events, does not adversely affect any safety-related equipment, design code and standard allowable value, safety-related function or design analysis, nor does the change adversely affect any safety analysis input or result, radioactive material barrier, or design/safety margin.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 52, Appendix D, VIII.B.6 and VIII.B.5.a, require prior NRC approval for departure from Tier 2* information and for Tier 2 information departures that involve changes to Tier 2* information, respectively. This change, which includes changes to supplemental requirements for steel structures includes a Tier 2 departure which involves a revision to Tier 2* information and thus requires NRC approval. Therefore, a license amendment request (LAR) (as supplied herein) is required.

10 CFR Part 50, Appendix A, General Design Criteria (GDC) 1 requires that structures be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed. The proposed change does not adversely change the criteria for the design, analysis, and construction of nuclear island structures. These structures remain in conformance with the code requirements identified and supplemented in the UFSAR (i.e., applicable portions of ACI 349-01 and AISC N690-1994) and the supplemental requirements identified in the Updated Final Safety Analysis Report (UFSAR) Subsection 3.8.

10 CFR Part 50, Appendix A, GDC 2 requires that structures withstand the effects of earthquakes and appropriate combinations of the effects of normal and accident conditions, including the effects of environmental loadings, such as earthquakes and other natural phenomena. The proposed change has no impact on the seismic motions to which the nuclear island structures are subjected, no impact on the response of the nuclear island structures to seismic motions, and no impact on the ability of the structures to resist seismic loads.

10 CFR Part 50, Appendix A, GDC 4 requires that systems structures and components can withstand the dynamic effects associated with missiles, pipe whipping, and discharging fluids, excluding dynamic effects associated with pipe ruptures, the probability of which is extremely low under conditions consistent with the design basis for the piping. The proposed change does not change the configuration of the walls and floors which provide separation between sources and potential targets. The

proposed change has no impact on the capability of the systems, structures, and components to withstand dynamic effects associated with missiles, pipe whipping, and discharging fluids as required by this criterion. The proposed change does not change the requirements for anchoring safety related components and supports to seismic Category I structures.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The requested amendment proposes a change to UFSAR Tier 2* information to specify the requirement of American Concrete Institute (ACI) 349-01 "Code Requirements for Nuclear Safety Related Structures," (ACI 349-01) for demonstrating that weld capacity for C2/C3J weldable couplers to structural steel is at least 125% of the specified yield strength of the reinforcing bar (rebar), by analysis of rebar sizes #4, #5, and #6 using a 1.6 stress limit coefficient (SLC). The proposed change further specifies the weld capacity is met as permitted by American Institute of Steel Construction (AISC) N690-1994, "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities," (AISC N690-1994) Section Q1.22.2, by testing samples of the C2/C3J coupler size #7, #8, #9, #10, and #11 rebar-coupler-PJP weld with fillet weld reinforcement combination using a series of a minimum of six static and three cyclic tests, retaining the 95% characteristic value with 90% probability (90%/95% confidence interval) of the tension test results per ACI 349-01 Section B.4.2; and by testing to failure representative samples of weld configurations of each of the five C2/C3J coupler sizes used to join couplers to structural steel to establish a minimum fillet reinforcement size for the C2/C3J couplers. Additionally, the proposed change adds Tier 2 information to UFSAR subsection 3.8.4.5.1 specifying the tests also demonstrate non-conforming 1/4-inch fillet welds for #9 and #11 C3J couplers are acceptable.

An evaluation to determine whether or not a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

4.3.1 Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed change does not affect the operation of any systems or equipment that initiate an analyzed accident or alter any structures, systems, and components (SSC) accident initiator or initiating sequence of events. The change revises how analysis and testing are used to demonstrate the capacity of partial joint penetration (PJP) welds with fillet weld reinforcement joining weldable rebar couplers to structural steel to meet the strength requirements of American Concrete Institute (ACI) 349-01, "Code Requirements for Nuclear

Safety Related Concrete Structures," and to establish a minimum fillet reinforcement size for the C2/C3J couplers.

The change has no adverse effect on the design function of the mechanical couplers or the SSCs to which the mechanical couplers are welded. The probabilities of the accidents evaluated in the Updated Final Safety Analysis Report (UFSAR) are not affected.

The change does not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor does the proposed change create any new accident precursors.

Therefore, the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

4.3.2 Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change does not affect the operation of any systems or equipment that may initiate a new or different kind of accident, or alter any SSC such that a new accident initiator or initiating sequence of events is created. The proposed change specifies how the analysis and testing requirements of ACI 349-01 are applied to demonstrate the capacity of combined PJP welds with fillet weld reinforcement joining rebar couplers to structural steel and to establish a minimum fillet reinforcement size for the C2/C3J couplers.

The proposed change does not adversely affect the design function of the mechanical couplers, the structures in which the couplers are used, or any other SSC design functions or methods of operation in a manner that results in a new failure mode, malfunction, or sequence of events that affect safety-related or non-safety-related equipment. This activity does not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that result in significant fuel cladding failures.

Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

4.3.3 Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

The proposed change maintains existing safety margin and provides adequate protection through continued application of the existing requirements in the UFSAR and clarifying the existing requirements in ACI 349-01 for welds of mechanical couplers joining rebar to structural steel. The proposed change satisfies the same design functions in accordance with the same codes and standards as stated in the UFSAR. This change does not adversely affect any design code, function, design analysis, safety analysis input or result, or design/safety margin. No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed change.

Because no safety analysis or design basis acceptance limit/criterion is challenged or exceeded by this change, no significant margin of safety is reduced.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

4.4 Conclusions

This assessment addresses the considerations discussed above. The plant licensing bases, safety analyses, and design bases evaluations demonstrate that the requested change is accommodated without an increase in the probability or consequences of an accident previously evaluated, without creating the possibility of a new or different kind of accident from any accident previously evaluated, and without a significant reduction in a margin of safety. In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Having arrived at negative declarations with regard to the criteria of 10 CFR 50.92, this assessment determined that the requested change does not involve a Significant Hazards Consideration.

5. Environmental Considerations

This review supports a request to amend the Combined License (COL) to allow departure from various elements of the certification information in the Updated Final Safety Analysis Report (UFSAR) Tier 2 and Tier 2*. The proposed amendment specifies the requirements

of American Concrete Institute (ACI) 349-01 “Code Requirements for Nuclear Safety Related Concrete Structures,” (ACI 349-01) Section 12.14.3.4 when evaluating the strength of welds used to join weldable mechanical couplers to structural steel, by specifying analysis and testing are used to determine the combined capacity of partial joint penetration (PJP) welds with fillet weld reinforcement joining the reinforcing bar (rebar) coupler to structural steel and to establish a minimum fillet reinforcement size for the C2/C3J couplers.

Sections 2 and 3 of this license amendment request provide the details of the proposed change.

The Licensee has determined that the anticipated construction and operational effects of the proposed amendment meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

(i) *There is no significant hazards consideration.*

As documented in Section 4.3, Significant Hazards Consideration Determination, of this license amendment request, an evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment.” The Significant Hazards Consideration determined that (1) the requested amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the requested amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the requested amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the requested amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of “no significant hazards consideration” is justified.

(ii) *There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.*

The proposed change clarifies the requirements for use of ACI 349-01 by specifying how analysis and testing are used to demonstrate the combined capacity of PJP welds with fillet weld reinforcement joining rebar couplers to structural steel and to establish a minimum fillet reinforcement size for the C2/C3J couplers. Therefore, the proposed change is unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed change does not affect any effluent release path or diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the requested amendment does not involve a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite.

(iii) *There is no significant increase in individual or cumulative occupational radiation exposure.*

The proposed change in the requested amendment clarifies the requirements for use of ACI 349-01 by specifying how analysis and testing requirements are used to demonstrate the combined capacity of PJP welds with fillet weld reinforcement joining the rebar coupler to structural steel and to establish a minimum fillet reinforcement size for the C2/C3J couplers. Plant radiation zones (addressed in UFSAR Section 12.3) are not affected, and controls under 10 CFR 20 preclude a significant increase in occupational radiation exposure. Therefore, the requested amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the proposed amendment, it has been determined that anticipated construction and operational impacts of the proposed amendment do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. References

1. American Concrete Institute (ACI), “Building Code Requirements for Structural Concrete (ACI 318-95) and Commentary (ACI 318R-95)”
2. American Concrete Institute (ACI), “Code Requirements for Nuclear Safety Related Concrete Structures,” (ACI 349-01)
3. American Institute of Steel Construction (AISC), “Seismic Provisions for Structural Steel Buildings,” (AISC 341-2010)
4. American Institute of Steel Construction (AISC), “Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities,” (AISC N690-1994)
5. American Welding Society (AWS) “Structural Welding Code – Steel,” (AWS D1.1-1992)
6. American Welding Society (AWS) “Structural Welding Code – Steel,” (AWS D1.1-2000)
7. American Welding Society (AWS) “Structural Welding Code – Reinforcing Steel,” (AWS D1.4-1998)
8. American Welding Society (AWS), “Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding,” (AWS 5.18-2005)
9. APP-1200-S3R-003, “Design Report for the AP1000 Enhanced Shield Building,” Rev. 2
10. APP-GW-GLR-602, “AP1000 Shield Building Design Details for Select Wall and RC/SC Connection,” Rev. 5

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-15-0518

Enclosure 3

Proposed Changes to Licensing Basis Documents

(LAR 15-08)

Note:
Added text is shown as **Blue Underline**
Deleted text is shown as **~~Red Strikethrough~~**
Omitted text is shown as three asterisks (* * *)

(Enclosure 3 consists of three pages, including this cover page)

UFSAR Subsection 3.8.4.5.1, "Supplemental Requirements for Concrete Structures" - Revise to add Tier 2 and Tier 2* text after the existing Tier 2* text in this subsection, as shown below:

* * *

[*Design and construction of fastening to concrete is in accordance with ACI 349-01, Appendix B*]* and are in conformance with the regulatory positions of NRC Regulatory Guide 1.199, Revision 0. [*Alternative requirements to ACI 349, Appendix B apply to the anchoring of headed shear reinforcement for the basemat (see Subsection 3.8.4.4.1). Alternative requirements to ACI 349, Appendix B apply to the anchoring of headed reinforcement above the basemat (see Subsection 3.8.4.4.1).*]*

Weldable coupler connections of reinforcing bar to structural steel shall develop 125% of the specified yield strength of the bar in accordance with ACI 349-01 Section 12.14.3.4. Qualification of the C2/C3J coupler welds is demonstrated as follows:

For reinforcing bar sizes #4, #5, and #6, the coupler connection weld adequacy is demonstrated by calculations in accordance with AISC N690-1994 requirements using a stress limit coefficient (SLC) of 1.6.

For reinforcing bar sizes #7, #8, #9, #10, and #11, coupler connection weld adequacy is demonstrated through testing, as permitted by AISC N690-1994 Section Q1.22.2. Two sets of testing are performed to demonstrate that the strength of the reinforcing bar is the limiting feature of the coupler reinforcing bar splice and weld system:

(1) Six static tension tests are performed for each reinforcing bar size on samples of the coupler reinforcing bar splice and weld system, retaining the 90%/95% upper confidence limit of the coupler system static tension test results. Three cyclic tests are also performed as described in ACI 349-01 12.14.3.4.1(b) to confirm that there is not significant coupler system degradation under cyclic demand.

(2) Static tension testing of the coupler weld to failure using ten representative sample weld configurations from each of the five reinforcing bar coupler sizes is performed to determine the 90%/95% lower confidence limit weld capacity.

The tests demonstrate that the factor of safety between the weld 90%/95% lower confidence limit and 125% of the specified yield strength of the reinforcing bar exceeds 1.4. The tests also demonstrate that the factor of safety between the weld 90%/95% lower confidence limit and the 90%/95% upper confidence limit of the coupler system static tension test results exceeds 1.0. The analyses and tests establish a minimum fillet reinforcement size for the C2/C3J couplers:

C2/C3J Coupler Size	*#4*	*#5*	*#6*	*#7*	*#8*	*#9*	*#10*	*#11*
Min. Fillet Weld Size (inches)	*1/4*	*1/4*	*1/4*	*1/4*	*1/4*	*5/16*	*1/4*	*3/8*]*

The tests also demonstrate that non-conforming 1/4-inch fillet welds for #9 and #11 C3J couplers identified in module CA20 are acceptable by comparing the 90%/95% lower confidence limit weld

strength to 125% of the specified yield strength of the reinforcing bar and to the 90%/95% upper confidence limit of the coupler system static tension test results. The factor of safety exceeds 1.3 in comparison to 125% of the specified yield strength of the reinforcing bar and 1.0 in comparison to the 90%/95% upper confidence limit of the coupler system.

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-15-0518

Enclosure 4

Affidavit from South Carolina Electric and Gas Company for Withholding Under 10 CFR 2.390 (LAR 15-08)

(Enclosure 4 consists of three pages, including this cover page)

Affidavit of April Rice

1. My name is April Rice. I am the Manager, Nuclear Licensing, for the South Carolina Electric & Gas Company (SCE&G). I have been delegated the function of reviewing the information sought to be withheld from public disclosure and I am authorized to apply for its withholding on behalf of SCE&G.

2. I am making this affidavit on personal knowledge, in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations, and in conjunction with SCE&G's filings on dockets 52-027 and 52-028 requesting license amendments related to LAR 15-08. I have personal knowledge of the criteria and procedures used by SCE&G to designate information as a trade secret, privileged, or as confidential commercial or financial information.

3. Based on the criteria in 10 CFR 2.390(a)(4), this affidavit seeks to withhold from public disclosure Enclosure 2 of SCE&G's LAR 15-08, NND-15-0518.

4. The information is of a type customarily held in confidence by SCE&G and not customarily disclosed to the public. SCE&G has a rational basis for determining the types of information customarily held in confidence by it and utilizes a systematic process to determine when and whether to hold certain types of information in confidence.

5. To satisfy the requirements of 10 CFR 2.390(b)(1)(i)(B) and (b)(1)(ii)(E), a non-proprietary version of Enclosure 2 can be found in Enclosure 1 of SCE&G's LAR 15-08, NND-15-0518. Withheld information is bracketed with superscripts of a and c, to indicate the following reasons for withholding:

   - *(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.*

   - *(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.*

6. The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390; it is to be received in confidence by the Commission.

7. To the best of my knowledge and belief, the information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method.

NND-15-0518
Enclosure 4
Affidavit from South Carolina Electric and Gas Company

I declare under penalty of perjury that the foregoing is true and correct.

_______________________ Executed on 8-24-15
April R. Rice Date

SWORN and SUBSCRIBED to before me on this 24th day of August, 2015 in Fairfield county, South Carolina

Tamela D Cohen
Notary Public
My Commission Expires:

TAMELA D COHEN
NOTARY PUBLIC
MY COMMISSION EXPIRES 04-15-2023
SOUTH CAROLINA

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-15-0518

Enclosure 5

Westinghouse Authorization Letter CAW-15-4176, Affidavit, Proprietary Information Notice and Copyright Notice

(LAR 15-08)

(Enclosure 5 consists of eight pages, including this cover page)

Westinghouse

Westinghouse Electric Company
New Plants & Major Projects
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USA

Document Control Desk
U S Nuclear Regulatory Commission
Washington, DC 20852-2738

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e-mail: delongra@westinghouse.com
Proj letter: VSL_VSG_000321

CAW-15-4176

August 20, 2015

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: Transmittal of License Amendment Request APP-FSAR-GLN-668 Revision 1 (Westinghouse LAR-111, SCE&G LAR 15-08)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-15-4176 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The Affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by South Carolina Electric & Gas Company.

Correspondence with respect to the proprietary aspects of the Application for Withholding or the Westinghouse Affidavit should reference CAW-15-4176, and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066.

Very truly yours,

Richard A. DeLong, Director
International Licensing & Regulatory Support

CAW-15-4176
August 20, 2015

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

I, Richard A. DeLong, am authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

Richard A. DeLong, Director
International Licensing & Regulatory Support

(1) I am Director, International Licensing & Regulatory Support, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(iii) There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iv) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(v) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(vi) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in APP-FSAR-GLN-668 (Clarification of Supplemental Requirements for Mechanical Coupler Welds for Steel Structures, Westinghouse LAR-111, SCE&G LAR 15-08), Revision 1, for submittal to the Commission, being transmitted by South Carolina Gas & Electric Company letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the NRC review of the License Amendment Request APP-FSAR-GLN-668 Revision 1 (Westinghouse LAR-111, SCE&G LAR 15-08), and may be used only for that purpose.

(a) This information is part of that which will enable Westinghouse to:

(i) Manufacture and deliver products to utilities based on proprietary designs.

(b) Further this information has substantial commercial value as follows:

(i) Westinghouse plans to sell the use of similar information to its customers for the purpose of licensing of new nuclear power stations.

(ii) Westinghouse can sell support and defense of industry guidelines and acceptance criteria for plant-specific applications.

(iii) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the Affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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